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MEMORANDUM

TO: Michael Berkoff, USEPA

REF. NO.: 056393-08

FROM: Greg Carli/Jodie Dembowski/18

DATE: January 7, 2013

C.C.: 12th Street Landfill Technical Team:
Richard Gay, Weyerhaeuser; Kristi Zakrzewski, MDEQ;
John Bradley, MDEQ; Jeff Keiser, CH2MHill;
Scott Hutsell, CH2MHill



RE: **October 2012 Quarterly Groundwater Sampling Results**
12th Street Landfill-Operable Unit No. 4-Allied Paper/Portage Creek/Kalamazoo River
Superfund Site, Otsego Township, Michigan

This memorandum has been prepared by Conestoga-Rovers & Associates (CRA) to summarize the results of the October 2012 semiannual groundwater sampling event performed at the 12th Street Landfill, Operable Unit No. 4 - Allied Paper/Portage Creek/Kalamazoo River Superfund Site, located in Otsego Township, Michigan between October 22 and 23, 2012.

The October 2012 sampling event was the sixth sampling event performed as part of the Operation, Maintenance, and Monitoring (OM&M) activities at the Site. The most recent sampling event prior to this was the July 2012 semiannual event.

A total of 15 groundwater monitoring wells (MW-101S, MW-101D, MW-102S, MW-102D, MW-103D, MW-104S, MW-104D, MW-105S, MW-105D, MW-106S, MW-106D, MW-107S, MW-108S, MW-108D, and MW-109D) were installed in February 2011, at varying depths, around the perimeter of the landfill to complete the OM&M monitoring well network. The locations of the monitoring wells are shown on Figure 1. Prior to the October 2012 sampling event, CRA collected static water levels for 2 weeks from each well and the river staff gauge, as required by the OM&M Plan (April 2012). Monitoring well construction details and groundwater elevations from the water level collection event are presented in Table 1. Figure 2 presents the shallow groundwater elevation contours, and Figure 3 presents the deep groundwater elevation contours, both from the pre-sampling water level event on October 22, 2012.

During the October 2012 groundwater sampling event, samples were collected from each monitoring well in the monitoring well network. Field measurements of pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), conductivity (mS/cm), temperature (Deg C), and turbidity (NTU) were collected. Samples were collected using low flow sampling and submitted for laboratory analysis of polychlorinated biphenyls (PCBs), target analyte list (TAL) for inorganics, cyanide, and TCL volatile compounds (VOCs). The October 2012 analytical results were compared to Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria, identified by Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division (RRD)

Op Memo No. 1, updated September 28, 2012, pursuant to 1994 PA 451, as amended. The October 2012 analytical results and field parameters are presented in Table 2.

The analytical results of the October 2012 sampling event yielded only mercury exceeding relevant Part 201 Cleanup Criteria and Part 213 Risk-Based Criteria at one monitoring well. The groundwater surface water interface (GSI) criterion of 0.0013 micrograms per liter ($\mu\text{g/L}$) for mercury was exceeded at MW-106S (0.0118 $\mu\text{g/L}$).

The analytical results for metals exceeding GSI criteria from previous sampling events performed in April 2011, October 2011, February 2012, April 2012 and July 2012 are shown on Figure 4 in addition to the October 2012 exceedance. Figure 4 also includes total PCB detections from all six sampling events.

The following summarizes the October 2012 analytical results:

- PCBs parameters were non-detect
- Mercury was detected in one of the October 2012 samples at MW-106S. The detection of 0.0118 $\mu\text{g/L}$ was above the GSI criteria of 0.0013 $\mu\text{g/L}$
- Cyanide was non-detect
- VOC parameters were non-detect

Quarterly and semiannual groundwater monitoring will continue at the Site as described in the OM&M Plan, submitted to United States Environmental Protection Agency (USEPA) on May 9, 2011, and revised on April 18, 2012. A revised OM&M Plan was submitted to the USEPA December 28, 2012 based on comments received by the USEPA on November 30, 2012.

The next sampling event is scheduled to occur in January/February 2013 and will consist of a semiannual event as outlined in the OM&M Plan [i.e., TCL VOCs, SVOCs, PCBs, total analyte list (TAL) metals, and polychlorinated dibenzodioxins/ polychlorinated dibenzofurans (PCDD/PCDF)].

TABLE 1

**GROUNDWATER MONITORING WELLS
OCTOBER 2012 WATER LEVEL DATA
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN**

<i>Locations</i>	<i>Ground Surface Elevation (feet AMSL)</i>	<i>Reference Elevation (feet AMSL)</i>	<i>Monitoring Well Depth (feet bgs)</i>	<i>Screened Interval (feet AMSL)</i>	<i>October 2012 Water Level Data Water Level Elevation (feet AMSL)</i>						
					<i>8-Oct-12</i>	<i>10-Oct-12</i>	<i>12-Oct-12</i>	<i>15-Oct-12</i>	<i>17-Oct-12</i>	<i>19-Oct-12</i>	<i>22-Oct-12</i>
MW-101S	734.35	737.46	39	702.35 to 695.35	700.46	700.46	700.49	701.06	700.96	701.08	701.22
MW-101D	734.33	737.14	75	664.33 to 659.33	700.44	700.47	700.26	701.13	700.97	701.07	701.23
MW-102S	704.18	707.36	10	701.18 to 694.18	700.56	700.56	700.58	701.21	701.06	701.21	701.26
MW-102D	704.43	707.43	45	664.43 to 659.43	700.59	700.61	700.61	701.25	701.09	701.24	701.29
MW-103D	704.37	707.36	35	674.37 to 669.37	699.92	699.98	699.98	700.70	700.43	700.62	700.71
MW-104S	703.86	706.55	25.5	684.86 to 677.86	699.42	699.50	699.48	700.26	699.93	700.15	699.94
MW-104D	703.48	706.42	45	663.48 to 658.48	699.45	699.53	699.52	700.29	699.95	700.17	699.92
MW-105S	704.89	707.86	12	699.89 to 692.89	699.22	699.31	699.29	700.21	699.69	700.00	699.74
MW-105D	704.78	707.89	47	662.78 to 657.78	699.42	699.49	699.45	700.37	699.87	700.14	699.75
MW-106S	703.88	706.96	9	701.88 to 694.88	699.13	699.18	699.17	700.25	699.61	700.04	699.66
MW-106D	703.66	706.36	45	664.66 to 659.66	699.27	699.32	699.29	700.30	699.69	700.03	699.72
MW-107S	703.76	706.73	13	695.76 to 690.76	699.35	699.39	699.38	700.39	699.78	700.12	699.81
MW-108S	703.32	706.21	9	701.32 to 694.32	699.50	699.51	699.51	700.51	699.91	700.23	699.96
MW-108D	703.39	706.16	45	663.39 to 658.39	699.44	699.44	699.47	700.47	699.84	700.17	699.90
MW-109D	707.41	710.46	23	689.41 to 684.41	700.04	700.05	700.06	700.88	700.53	700.73	700.88
SG-101	700.9	703.05	-	-	698.83	698.87	698.87	700.07	699.28	699.66	699.27

TABLE 2
SUMMARY OF OCTOBER 2012 GROUNDWATER ANALYTICAL RESULTS
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

<u>Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non- Residential Generic Cleanup Criteria</u> ⁽¹⁾					MW-101D	MW-101S	MW-102D	MW-102S	MW-103D	MW-104D
Sample Location	Residential	Non-Residential	Groundwater		GW-56393-102312-JV-113	GW-56393-102312-JV-112	GW-56393-102312-JV-110	GW-56393-102312-JV-109	GW-56393-102312-JV-108	GW-56393-102312-JV-107
Sample Identification	Drinking Water ^(a)	Drinking Water ^(b)	Surface Water		10/23/2012	10/23/2012	10/23/2012	10/23/2012	10/23/2012	10/22/2012
Sample Date			Interface ^(c)							
Sample Type										
Screen Depth					Screen_Depth: (70-75)	Screen_Depth: (32-29)	Screen_Depth: (40-45)	Screen_Depth: (3-10)	Screen_Depth: (30-35)	Screen_Depth: (40-45)
Sample Elevation (feet AMSL)					664.33-589.33	702.35-663.35	664.43-619.43	701.18-691.18	674.37-639.37	633.48-618.48
Units										
Volatile Organic Compounds (VOCs)										
Acetone	ug/L	730	2100	1700	20 U					
Benzene	ug/L	5	5	200	0.50 U					
Bromodichloromethane	ug/L	80	80	ID	0.50 U					
Bromoform	ug/L	80	80	ID	0.50 U					
Bromomethane (Methyl bromide)	ug/L	10	29	35	0.50 U					
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	13000	38000	2200	R	R	R	R	R	R
Carbon disulfide	ug/L	800	2300	ID	0.50 U					
Carbon tetrachloride	ug/L	5	5	45	0.50 U					
Chlorobenzene	ug/L	100	100	25	0.50 U					
Chloroethane	ug/L	430	1700	1100	0.50 U					
Chloroform (Trichloromethane)	ug/L	80	80	350	0.50 U					
Chloromethane (Methyl chloride)	ug/L	260	1100	ID	0.50 UJ					
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	0.2	0.2	-	2.0 U					
Dibromochloromethane	ug/L	80	80	ID	0.50 U					
1,2-Dibromoethane (Ethylene dibromide)	ug/L	0.05	0.05	5.7	2.0 U					
1,2-Dichlorobenzene	ug/L	600	600	13	0.50 U					
1,3-Dichlorobenzene	ug/L	6.6	19	28	0.50 U					
1,4-Dichlorobenzene	ug/L	75	75	17	0.50 U					
Dichlorodifluoromethane (CFC-12)	ug/L	1700	4800	ID	0.50 UJ					
1,1-Dichloroethane	ug/L	880	2500	740	0.50 U					
1,2-Dichloroethane	ug/L	5	5	360	0.50 U					
1,1-Dichloroethene	ug/L	7	7	130	0.50 U					
cis-1,2-Dichloroethene	ug/L	70	70	620	0.50 U					
trans-1,2-Dichloroethene	ug/L	100	100	1500	0.50 U					
1,2-Dichloropropane	ug/L	5	5	230	0.50 U					
cis-1,3-Dichloropropene	ug/L	-	-	-	0.50 U					
trans-1,3-Dichloropropene	ug/L	-	-	-	0.50 U					
Ethylbenzene	ug/L	74	74	18	0.50 U					
2-Hexanone	ug/L	1000	2900	ID	20 U					
Isopropyl benzene	ug/L	800	2300	28	2.0 U					
Methyl tert butyl ether (MTBE)	ug/L	40	40	7100	0.50 U					
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	1800	5200	ID	20 U					
Methylene chloride	ug/L	5	5	1500	2.0 U					
Styrene	ug/L	100	100	80	0.50 U					
1,1,2,2-Tetrachloroethane	ug/L	8.5	35	78	0.50 U					
Tetrachloroethene	ug/L	5	5	60	0.50 U					
Toluene	ug/L	790	790	270	0.50 U					
1,2,4-Trichlorobenzene	ug/L	70	70	99	2.0 U					
1,1,1-Trichloroethane	ug/L	200	200	89	0.50 U					
1,1,2-Trichloroethane	ug/L	5	5	330	0.50 U					
Trichloroethene	ug/L	5	5	200	0.50 U					
Trichlorofluoromethane (CFC-11)	ug/L	2600	7300	-	0.50 U					
Vinyl chloride	ug/L	2	2	13	0.50 U					
o-Xylene	ug/L	280	280	41	0.50 U					
m&p-Xylenes	ug/L	-	-	-	0.50 U					

TABLE 2

SUMMARY OF OCTOBER 2012 GROUNDWATER ANALYTICAL RESULTS
 12th STREET LANDFILL
 OTSEGO TOWNSHIP, MICHIGAN

Sample Location	<i>Michigan Act 451, Part 201 Cleanup Criteria and Part 213, Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria</i> ⁽¹⁾			MW-101D	MW-101S	MW-102D	MW-102S	MW-103D	MW-104D
	Residential Drinking Water ^(a)	Non-Residential Drinking Water ^(b)	Groundwater Surface Water Interface ^(c)	GW-56393-102312-JV-113 10/23/2012	GW-56393-102312-JV-112 10/23/2012	GW-56393-102312-JV-110 10/23/2012	GW-56393-102312-JV-109 10/23/2012	GW-56393-102312-JV-108 10/23/2012	GW-56393-102212-JV-107 10/22/2012
Sample Identification									
Sample Date									
Sample Type									
Screen Depth				Screen_Depth: (70-75)	Screen_Depth: (32-29)	Screen_Depth: (40-45)	Screen_Depth: (3-10)	Screen_Depth: (30-35)	Screen_Depth: (40-45)
Sample Elevation (feet AMSL)				664.33-589.33	702.35-663.35	664.43-619.43	701.18-691.18	674.37-639.37	633.48-618.48
Units									
Metals									
Cyanide (amenable)	ug/L	200	200	-	10 U				
Cyanide (total)	ug/L	200	200	5.2	10 U				
Magnesium	ug/L	400000	1100000	-	23300	24100	23200	24300	23200
Mercury	ug/L	2	2	0.0013	0.001 U				
Sodium	ug/L	120000	350000	-	23800	23700	20400	22000	18800
PCBs									
Aroclor-1016 (PCB-1016)	ug/L	-	-	-	0.020 U				
Aroclor-1221 (PCB-1221)	ug/L	-	-	-	0.040 U				
Aroclor-1232 (PCB-1232)	ug/L	-	-	-	0.020 U				
Aroclor-1242 (PCB-1242)	ug/L	-	-	-	0.020 U				
Aroclor-1248 (PCB-1248)	ug/L	-	-	-	0.020 U				
Aroclor-1254 (PCB-1254)	ug/L	-	-	-	0.020 U				
Aroclor-1260 (PCB-1260)	ug/L	-	-	-	0.020 U				
Total PCBs	ug/L	0.5	0.5	0.2	ND	ND	ND	ND	ND
Field Parameters									
Conductivity	mS/cm	-	-	-	0.785	0.788	0.738	0.795	0.712
Dissolved oxygen (DO)	mg/L	-	-	-	2.79	2.57	2.40	0.44	1.10
Oxidation reduction potential (ORP)	millivolts	-	-	-	116.5	122.6	120.2	112.8	143.6
pH	s.u.	6.5 - 8.5	6.5 - 8.5	-	7.17	7.02	7.11	6.92	6.94
Temperature	Deg C	-	-	-	14.17	16.04	14.30	17.16	13.21
Turbidity	NTU	-	-	-	1.10	1.10	3.27	1.73	3.61

Notes:
⁽¹⁾ Cleanup criteria identified by MDEQ Op Memo No. 1 updated 9/28/12, pursuant to 1994 PA 451 as amended
 U - Not present at or above the associated value.
 J - Laboratory qualifier - estimated concentration.
 UJ - Estimated reporting limit.
 R - Rejected.

SUMMARY OF OCTOBER 2012 GROUNDWATER ANALYTICAL RESULTS
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Sample Location	MW-104S	MW-105D	MW-105S	MW-106D	MW-106D	MW-106S	MW-107S	MW-108D
Sample Identification	GW-56393-102212-JV-106	GW-56393-102212-JV-105	GW-56393-102212-JV-104	GW-56393-102212-JV-102	GW-56393-102212-JV-103	GW-56393-102212-JV-101	GW-56393-102212-JV-100	GW-56393-102212-JV-099
Sample Date	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012
Sample Type					Duplicate			
Screen Depth	Screen_Depth: (20-25)	Screen_Depth: (42-47)	Screen_Depth: (5-12)	Screen_Depth: (40-45)	Screen_Depth: (40-45)	Screen_Depth: (2-9)	Screen_Depth: (8-13)	Screen_Depth: (40-45)
Sample Elevation (feet AMSL)	684.86-658.86	662.79-615.79	699.89-687.89	664.66-620.66	664.66-620.66	701.89-692.89	695.76-682.76	663.39-618.39
	Units							
Volatile Organic Compounds (VOCs)								
Acetone	ug/L	20 U						
Benzene	ug/L	0.50 U						
Bromodichloromethane	ug/L	0.50 U						
Bromotorm	ug/L	0.50 U						
Bromomethane (Methyl bromide)	ug/L	0.50 U						
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	R	R	R	R	R	R	R
Carbon disulfide	ug/L	0.50 U	0.11 J	0.50 U				
Carbon tetrachloride	ug/L	0.50 U						
Chlorobenzene	ug/L	0.50 U						
Chloroethane	ug/L	0.50 U						
Chloroform (Trichloromethane)	ug/L	0.50 U						
Chloromethane (Methyl chloride)	ug/L	0.50 UJ	0.50 U	0.50 U				
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	2.0 U						
Dibromochloromethane	ug/L	0.50 U						
1,2-Dibromoethane (Ethylene dibromide)	ug/L	2.0 U						
1,2-Dichlorobenzene	ug/L	0.50 U						
1,3-Dichlorobenzene	ug/L	0.50 U						
1,4-Dichlorobenzene	ug/L	0.50 U						
Dichlorodifluoromethane (CFC-12)	ug/L	0.50 UJ	0.50 U	0.50 U				
1,1-Dichloroethane	ug/L	0.50 U	0.14 J					
1,2-Dichloroethane	ug/L	0.50 U						
1,1-Dichloroethene	ug/L	0.50 U						
cis-1,2-Dichloroethene	ug/L	0.50 U						
trans-1,2-Dichloroethene	ug/L	0.50 U						
1,2-Dichloropropane	ug/L	0.50 U						
cis-1,3-Dichloropropene	ug/L	0.50 U						
trans-1,3-Dichloropropene	ug/L	0.50 U						
Ethylbenzene	ug/L	0.50 U						
2-Hexanone	ug/L	20 U						
Isopropyl benzene	ug/L	2.0 U						
Methyl tert butyl ether (MTBE)	ug/L	0.50 U						
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	20 U						
Methylene chloride	ug/L	2.0 U						
Styrene	ug/L	0.50 U						
1,1,2,2-Tetrachloroethane	ug/L	0.50 U						
Tetrachloroethene	ug/L	0.50 U						
Toluene	ug/L	0.50 U						
1,2,4-Trichlorobenzene	ug/L	2.0 U						
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U						
Trichloroethene	ug/L	0.50 U						
Trichlorofluoromethane (CFC-11)	ug/L	0.50 U						
Vinyl chloride	ug/L	0.50 U						
o-Xylene	ug/L	0.50 U						
m&p-Xylenes	ug/L	0.50 U						

SUMMARY OF OCTOBER 2012 GROUNDWATER ANALYTICAL RESULTS
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Sample Location	MW-104S	MW-105D	MW-105S	MW-106D	MW-106D	MW-106S	MW-107S	MW-108D
Sample Identification	GW-56393-102212-JV-106	GW-56393-102212-JV-105	GW-56393-102212-JV-104	GW-56393-102212-JV-102	GW-56393-102212-JV-103	GW-56393-102212-JV-101	GW-56393-102212-JV-100	GW-56393-102212-JV-099
Sample Date	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012	10/22/2012
Sample Type					Duplicate			
Screen Depth	Screen_Depth: (20-25)	Screen_Depth: (42-47)	Screen_Depth: (5-12)	Screen_Depth: (40-45)	Screen_Depth: (40-45)	Screen_Depth: (2-9)	Screen_Depth: (8-13)	Screen_Depth: (40-45)
Sample Elevation (feet AMSL)	684.86-658.86	662.79-615.79	699.89-687.89	664.66-620.66	664.66-620.66	701.89-692.89	695.76-682.76	663.39-618.39
	Units							
Metals								
Cyanide (amenable)	ug/L	10 U						
Cyanide (total)	ug/L	10 U						
Magnesium	ug/L	23100	24500	27700	23500	23200	40900	25000
Mercury	ug/L	0.001 U	0.0118	0.001 U				
Sodium	ug/L	20900	22000	23800	22400	22200	19100	35300
PCBs								
Aroclor-1016 (PCB-1016)	ug/L	0.020 U						
Aroclor-1221 (PCB-1221)	ug/L	0.040 U	0.040 U	0.039 U	0.040 U	0.039 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	ug/L	0.020 U	0.026 U	0.020 U				
Aroclor-1242 (PCB-1242)	ug/L	0.020 U						
Aroclor-1248 (PCB-1248)	ug/L	0.020 U						
Aroclor-1254 (PCB-1254)	ug/L	0.020 U	0.020 U	0.020 U	0.0074 J	0.0057 J	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	ug/L	0.020 U						
Total PCBs	ug/L	ND	ND	ND	0.0074 J	0.0057 J	ND	ND
Field Parameters								
Conductivity	mS/cm	0.671	0.847	0.814	0.701	0.701	1.25	0.913
Dissolved oxygen (DO)	mg/L	1.69	1.49	0.14	2.62	2.62	0.39	0.15
Oxidation reduction potential (ORP)	millivolts	89	55.9	33	94	94	-51	-60
pH	s.u.	7.34	7.06	6.87	7.31	7.31	6.66	7.18
Temperature	Deg C	13.73	13.14	14.55	12.79	12.79	14.87	13.20
Turbidity	NTU	0.31	2.15	2.97	7.83	7.83	0.71	0.92

Notes:

⁽¹⁾ Cleanup criteria identified by MDEQ Op Memo No. 1

updated 9/28/12, pursuant to 1994 PA 451 as amended

U - Not present at or above the associated value.

J - Laboratory qualifier - estimated concentration.

UJ - Estimated reporting limit.

R - Rejected.

TABLE 2
SUMMARY OF OCTOBER 2012 GROUNDWATER ANALYTICAL RESULTS
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Sample Location	MW-108S	MW-109D
Sample Identification	GW-56393-102212-JV-098	GW-56393-102312-JV-111
Sample Date	10/22/2012	10/23/2012
Sample Type		
Screen Depth	Screen_Depth: (2-9)	Screen_Depth: (22-27)
Sample Elevation (feet AMSL)	701.32-692.32	689.41-666.41
	Units	
Volatile Organic Compounds (VOCs)		
Acetone	ug/L	20 U
Benzene	ug/L	0.50 U
Bromodichloromethane	ug/L	0.50 U
Bromoform	ug/L	0.50 U
Bromomethane (Methyl bromide)	ug/L	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	R
Carbon disulfide	ug/L	0.50 U
Carbon tetrachloride	ug/L	0.50 U
Chlorobenzene	ug/L	0.50 U
Chloroethane	ug/L	0.50 U
Chloroform (Trichloromethane)	ug/L	0.50 U
Chloromethane (Methyl chloride)	ug/L	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	2.0 U
Dibromochloromethane	ug/L	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	ug/L	2.0 U
1,2-Dichlorobenzene	ug/L	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U
Dichlorodifluoromethane (CFC-12)	ug/L	0.50 U
1,1-Dichloroethane	ug/L	0.50 U
1,2-Dichloroethane	ug/L	0.50 U
1,1-Dichloroethene	ug/L	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U
1,2-Dichloropropane	ug/L	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U
Ethylbenzene	ug/L	0.50 U
2-Hexanone	ug/L	20 U
Isopropyl benzene	ug/L	2.0 U
Methyl tert butyl ether (MTBE)	ug/L	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	20 U
Methylene chloride	ug/L	2.0 U
Styrene	ug/L	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	0.50 U
Tetrachloroethene	ug/L	0.50 U
Toluene	ug/L	0.50 U
1,2,4-Trichlorobenzene	ug/L	2.0 U
1,1,1-Trichloroethane	ug/L	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U
Trichloroethene	ug/L	0.50 U
Trichlorofluoromethane (CFC-11)	ug/L	0.50 U
Vinyl chloride	ug/L	0.50 U
o-Xylene	ug/L	0.50 U
m&p-Xylenes	ug/L	0.50 U

TABLE 2

SUMMARY OF OCTOBER 2012 GROUNDWATER ANALYTICAL RESULTS
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Sample Location	MW-108S	MW-109D	
Sample Identification	GW-56393-102212-JV-098	GW-56393-102312-JV-111	
Sample Date	10/22/2012	10/23/2012	
Sample Type			
Screen Depth	Screen_Depth: (2-9)	Screen_Depth: (22-27)	
Sample Elevation (feet AMSL)	701.32-692.32	689.41-666.41	
	<i>Units</i>		
Metals			
Cyanide (amenable)	ug/L	10 U	10 U
Cyanide (total)	ug/L	10 U	10 U
Magnesium	ug/L	25000	25000
Mercury	ug/L	0.001 U	0.001 U
Sodium	ug/L	21700	22300
PCBs			
Aroclor-1016 (PCB-1016)	ug/L	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	ug/L	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	ug/L	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	ug/L	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	ug/L	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	ug/L	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	ug/L	0.020 U	0.020 U
Total PCBs	ug/L	ND	ND
Field Parameters			
Conductivity	mS/cm	0.889	0.841
Dissolved oxygen (DO)	mg/L	1.81	1.96
Oxidation reduction potential (ORP)	millivolts	123	139.6
pH	s.u.	6.85	6.94
Temperature	Deg C	13.08	13.55
Turbidity	NTU	0.51	0.49

Notes:

⁽¹⁾ Cleanup criteria identified by MDEQ Op Memo No. 1

updated 9/28/12, pursuant to 1994 PA 451 as amended

U - Not present at or above the associated value.

J - Laboratory qualifier - estimated concentration.

UI - Estimated reporting limit.

R - Rejected.



MEMORANDUM

TO: Greg Carli
FROM: Susan Scrocchi/eew-17
cc: Jodie Dembowski
RE: Data Quality Assessment and Full Validation
Groundwater Monitoring – October 2012
12th Street Landfill, Otsego Township, Michigan

REF. NO.: 56393
DATE: December 10, 2012
REVISION: January 4, 2013

The following details a quality assessment and validation of the analytical data resulting from the October 2012, collection of water samples from the 12th Street Landfill Site in Otsego Township, Michigan. The sample summary detailing sample identification, sample location, quality control samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Columbia Analytical Services in Kelso, Washington (CAS) in accordance with the methodologies presented in Table 2. The validated analytical results are summarized in Table 3.

The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP). Application of quality assurance criteria was consistent with following guidance documents:

- i. "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-99/008, October 1999
- ii. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", EPA-540/R-94/013, February 1994

These guidelines are collectively referred to as "NFGs" in this Memorandum.

Sample Quantitation

The laboratory reported detected concentrations of organic and inorganic compounds below the laboratory's report limit (RL) but above the laboratory's method detection limit (MDL). The laboratory flagged these sample concentrations with a "J". These concentrations should be qualified as estimated (J) values unless qualified otherwise in this memorandum.

Sample Preservation and Holding Times

Sample holding time periods and preservation requirements are presented in Table 2.

All samples were prepared and/or analyzed within the specified holding time periods.
The samples were shipped and maintained in accordance with the sample preservation requirements.

Gas Chromatography/Mass Spectrometer (GC/MS) - Tuning and Mass Calibration (Instrument Performance Check) - Organic Analyses

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each GC/MS instrument used for volatile organic compound (VOC) analysis was checked at the beginning of each 12-hour period. The resulting spectra must meet the criteria cited in the NFGs before initiating an analysis sequence.

Instrument performance check data were reviewed. These tuning compounds were analyzed at the required frequency throughout the VOC analysis. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration - Organic Analyses

Initial calibration data are used to demonstrate that each instrument is capable of generating acceptable quantitative data. A five point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each over a specific concentration range.

Initial calibration criteria for organic analyses are evaluated against the following criteria:

- i. GC/MS (all compounds) - must meet a minimum mean relative response factor (RRF) of 0.05.
- ii. GC/MS (all compounds) - the percent relative standard deviation (RSD) values must not exceed 30.0 percent or a minimum coefficient of determination of 0.99 if quadratic equation calibration curves are used.
- iii. GC (all compounds using an average for multi-response compounds) - the percent RSD must not exceed 20 percent or a correlation coefficient of 0.995 when linear regression calibration curves are used.

Calibration standards were analyzed at the required frequency and the results met the above criteria for linearity and sensitivity with the exception of the qualified samples presented in Table 4.

Continuing Calibration - Organic Analyses

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, continuing calibration standards must be analyzed every 12 hours for GC/MS analyses. The following criteria are employed to evaluate the continuing calibration data:

- i. GC/MS (all compounds) - must meet a minimum mean RRF of 0.05.
- ii. GC/MS (all compounds) - the percent difference between the mean initial calibration RRF and the continuing calibration RRF must not exceed 25 percent.
- iii. GC/MS (compounds determined by quadratic curve) - the percent drift between the true value and the continuing calibration value must not exceed 25 percent.
- iv. GC (all compounds using average for multi-response compounds) - the percent difference between mean initial calibration factor and the continuing calibration factor must not exceed 15 percent.

- v. GC (compounds determined by linear regression) – the percent drift between the true value and the continuing calibration value must not exceed 15 percent.

Calibration standards were analyzed at the required frequency and the results met the above criteria for instrument sensitivity and linearity of response and sensitivity with the exception of the qualified samples presented in Table 5.

Inductively Coupled Plasma/Mass Spectrometer (ICP/MS) – Mass Calibration and Resolution Checks – Metal Analyses

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each ICP/MS instrument used for metals analyses was checked prior to calibration before initiating an analysis sequence through the analysis of a tuning solution. The results of the tuning solution analysis were reviewed against the following criteria:

- i. Analyze tuning solution a minimum of four times with a percent RSD of less than or equal to five for the analytes contained in the tuning solution
- ii. The mass resolution must be within 0.1 amu of the true value over the analytical range

Instrument performance check data were reviewed. The tuning solution was analyzed at the required frequency throughout the analyses. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration – Inorganic Analyses

Initial calibration of the instruments ensures that they are capable of producing satisfactory quantitative data at the beginning of a series of analyses. For ICP analysis, a calibration blank and at least one standard must be analyzed at each wavelength to establish the analytical curve. For instrumental wet chemistry analysis, a calibration blank and a minimum of four standards must be analyzed to establish the analytical curve. Resulting correlation coefficients for curves consisting of a blank and four or more standards must be at least 0.995.

For low level mercury analyses, three blanks and a minimum of five standards are analyzed. The average blank response is used to correct each standard response, and the corrected responses are used to calculate calibration factors. The calibration is acceptable if the RSD of the calibration factors is less than 15 percent and if recovery of the lowest standard is 75 to 125 percent.

Initial calibration is verified with an initial calibration verification (ICV) standard which must recover within 90 to 110 percent for metals by ICP, 77 to 123 percent for mercury by Atomic Fluorescence and 85 to 115 percent for general chemistry parameters.

A review of the laboratory data showed that the inorganic initial calibration curves and ICVs were analyzed at the appropriate frequency and were within the acceptance criteria.

Continuing Calibration – Inorganic Analyses

Continuing calibration verification (CCV) standards are analyzed at method specified frequency (one every 10 samples). The CCVs must meet the percent recovery control limits specified above for the ICVs. Criteria for inorganic analyses are the same criteria as used for assessing the initial calibration data.

A review of the laboratory data showed that CCVs were analyzed at the appropriate frequency and the data were within the acceptance criteria.

Method Blank Samples

Method blank samples are prepared from a purified sample matrix and are processed concurrently with investigative samples to assess the presence and the magnitude of sample contamination introduced during sample analysis. Method blank samples are analyzed at a minimum frequency of one per analytical batch and target analytes should be non-detect.

Some VOCs and metals were detected in the method blanks at low concentrations. All associated samples with similar results were qualified as non-detect (see Table 6). Where concentrations were either non-detect or significantly greater than the blanks, the data would not have been impacted.

Laboratory Blank Samples - Inorganic Analyses

Metals analyses include the analysis of initial calibration blanks (ICB) and continuing calibration blanks (CCB) to assess the presence and the magnitude of sample contamination introduced during sample analysis. The CCBs are analyzed at a minimum frequency of one every 10 samples and target analytes should be non-detect.

Some ICB and CCBs were reported with detectable concentrations of target analytes. The associated sample results were significantly greater than the blanks and would not have been impacted.

Surrogate Compounds - Organic Analyses

Individual sample performance for organic analyses was monitored by assessing the results of surrogate compound percent recoveries. Surrogate percent recoveries are reviewed against the laboratory developed control limits provided in the analytical report.

The surrogate recovery acceptance criteria were met for all samples that could be evaluated.

Matrix Spike/Matrix Spike Duplicate Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the relative percent difference (RPD) of the concentrations were determined. The organic MS/MSD percent recovery and RPD control limits are established by the laboratory. The inorganic control limits are defined by the methods or the laboratory and the NFG. The samples selected for MS/MSD analysis are identified in Table 1.

The MS/MSD percent recoveries and associated RPD acceptance criteria were met.

Laboratory Control Sample/Laboratory Control Duplicate Analyses

The laboratory control sample (LCS) and/or laboratory control duplicate (LCD) analyses serve as a monitor of the overall performance in all steps of the sample analysis and are analyzed with each sample batch. The LCS/LCD percent recoveries were evaluated against method and laboratory established control limits.

The LCS/LCD percent recoveries were within the laboratory control limits or did not warrant qualification, indicating that an acceptable level of overall performance was achieved.

Laboratory precision was verified by the relative percent difference (RPD) of the LCS/LCD when a matrix spike/matrix spike duplicate was not analyzed.

The RPDs were within the laboratory control limits, indicating that an acceptable level of overall laboratory precision was achieved.

Inductively Coupled Plasma (ICP) Interference Check Sample Analysis – Inorganic Analyses

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the ICP interference check samples (ICS) are analyzed. The ICSs are evaluated against recovery control limits of 80 to 120 percent.

The ICS analysis results were evaluated for all samples and were within the control limits.

Internal Standard Summaries – Organic Analyses

To correct for variability in the GC/MS response and sensitivity, internal standard (IS) compounds are added to all samples. All results are calculated as a ratio of the compound and associated IS response. Overall instrument stability and performance for VOC analysis was monitored using IS peak area and retention time (RT) data. The IS peak areas and RTs of the samples are required to meet the following criteria:

- i. IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated continuing calibration standard IS area counts
- ii. The RT of the IS must not vary by more than plus or minus 30 seconds from the associated continuing calibration standard

A review of the VOC internal standard data showed that the IS area counts and retention time data were within the acceptance criteria.

Internal Standard Summaries – Inorganic Analyses

To correct for variability in the ICP/MS response and sensitivity, internal standards (IS) are added to all samples. All results are calculated as a ratio of the IS response to the response of the sample.

Internal Standard Summaries - Inorganic Analyses (continued)

Overall instrument stability and performance for metals analyses was monitored using the IS intensity data which are evaluated against the following criteria:

- i. The IS intensities in samples must recover between 30 and 120 percent of the true value
- ii. The IS intensities in instrument calibration checks (CCVs and CCBs) must recover between 60 and 125 percent of the true value

A review of the ICP/MS metals IS data showed that the IS intensities were within the acceptance criteria.

Serial Dilution - Inorganic Analyses

The percent difference (D) between a serial dilution of a sample for each matrix was monitored to determine physical or chemical interference. A minimum of one sample per 20 investigative samples is analyzed at a five-fold dilution. The serial dilution results must agree within 10 percent D of the original results for samples with detected concentrations greater than 50 times the instrument detection limit.

The percent D acceptance criteria was met.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples.

The duplicate RPDs were within the acceptance criteria.

Post Digestion Spike Analyses - Inorganic Analyses

At least one spiked (pre-digestion) sample is prepared and analyzed for each analytical batch of metals. When the pre-digestion spike recovery falls outside of the control limits and the sample result is greater than four times the spike added, a post digestion spike is performed for those analytes that do not meet the specified criteria.

The post digestion spike results were evaluated and were within the control limits.

Contract Required Detection Limit (CRDL) Analyses - Inorganic Analyses

The instrument calibration near the Contract Required Detection Limit (CRDL) must be verified for each analyte reported. An ICP standard solution at the CRDL (CRI) is evaluated against the control limits provided.

The CRI analysis results were evaluated for all samples and were within the control limits.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The samples identified in Table 1 were reviewed. The organic compounds reported adhered to the specified identification criteria.

The reported quantitation results and detection limits were checked to ensure results reported were accurate. The samples identified in Table 1 were reviewed. No discrepancies were found between the raw data and the sample results reported by the laboratory.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of one (1) field blank (rinsate) sample, two (2) trip blank samples and one (1) field duplicate sample.

Field Blank Samples

To assess the efficiency of field decontamination procedures and cleanliness of sample containers, the rinsate sample identified in Table 1 was collected and analyzed.

The samples that should be qualified due to rinsate blank contamination are summarized in Table 7. No additional targeted analytes were reported as detected in the rinsate samples.

Trip Blank Samples

To monitor potential cross-contamination of VOC during sample transportation and storage, a trip blank was submitted to the laboratory for VOC analysis with each shipping cooler containing multiple samples.

Some VOCs and mercury were detected in the trip blank. Samples requiring qualification were previously qualified due to method and/or rinse blank.

Field Duplicate Samples

Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample set. The RPDs associated with these duplicate samples must be less than 50 percent for water samples. If the reported concentration in either the investigative sample or its duplicate is less than five times the RL, the evaluation criteria is one times the RL value for water samples.

The data indicate that an adequate level of precision was achieved for the sampling event.

System Performance

System performance between various quality control checks was evaluated to monitor for changes that may have caused the degradation of data quality. No technical problems or chromatographic anomalies were observed which would require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted with the exception of the following:

- 2-Butanone was rejected in a number of samples due to initial and continuing calibration violations.

TABLE 1

**SAMPLE COLLECTION AND ANALYSIS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012**

Sample Identification	Location	Matrix	QC Samples	Collection Date (mm/dd/yyyy)	Collection Time (hr:min)	Analysis/Parameter					
						TCL VOC	TCL PCB	Sodium/Magnesium	LL Mercury	Cyanide (amenable)	Cyanide (total)
CAS Work Order No. K1210729											
GW-56393-102212-JV-098	MW-108S	water		10/22/2012	10:10	X	X	X	X	X	X
GW-56393-102212-JV-099	MW-108D	water		10/22/2012	10:17	X	X	X	X	X	X
GW-56393-102212-JV-100	MW-107S	water		10/22/2012	10:02	X	X	X	X	X	X
GW-56393-102212-JV-101	MW-106S	water		10/22/2012	11:30	X	X	X	X	X	X
GW-56393-102212-JV-102	MW-106D	water		10/22/2012	11:20	X	X	X	X	X	X
GW-56393-102212-JV-103	MW-106D	water	DUP(GW-56393-102212-JV-102)	10/22/2012	11:35	X	X	X	X	X	X
GW-56393-102212-JV-104	MW-105S	water		10/22/2012	12:22	X	X	X	X	X	X
GW-56393-102212-JV-105	MW-105D	water		10/22/2012	13:05	X	X	X	X	X	X
GW-56393-102212-JV-106	MW-104S	water		10/22/2012	14:10	X	X	X	X	X	X
GW-56393-102212-JV-107	MW-104D	water		10/22/2012	14:15	X	X	X	X	X	X
GW-56393-102312-JV-108	MW-103D	water		10/23/2012	8:58	X	X	X	X	X	X
GW-56393-102312-JV-109	MW-102S	water	MS/MSD	10/23/2012	9:52	X	X	X	X	X	X
GW-56393-102312-JV-110	MW-102D	water		10/23/2012	9:52	X	X	X	X	X	X
GW-56393-102312-JV-111	MW-109D	water		10/23/2012	12:05	X	X	X	X	X	X
GW-56393-102312-JV-112	MW-101S	water		10/23/2012	12:35	X	X	X	X	X	X
GW-56393-102312-JV-113	MW-101D	water		10/23/2012	13:38	X	X	X	X	X	X
EB-56393-102312-JV-114	-	water	Equipment Blank	10/23/2012	14:20	X	X	X	X	X	X
TB-56393-102312-JV-115	-	water	Trip Blank	10/23/2012	-				X	X	
TB-56393-102312-JV-116	-	water	Trip Blank	10/23/2012	-	X				X	

Notes:

DUP - Field Duplicate of sample indicated in parentheses

LL - Low Level

MS/MSD - Matrix Spike/Matrix Spike Duplicate

PCB - Polychlorinated biphenyls

QC - Quality Control

TCL - Target Compound List

VOC - Volatile Organic Compounds

TABLE 2
SUMMARY OF ANALYTICAL METHODS, HOLDING TIME PERIODS, AND PRESERVATIVES
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Parameter</i>	<i>Method</i> ¹	<i>Matrix</i>	<i>Holding Time</i>	<i>Preservation</i>
TCL VOC	SW-846 8260	Water	- 14 days from sample collection to completion of analysis.	pH < 2 and Iced, 4 ± 2° C
PCB	SW-846 8082	Water	- 7 days from sample collection to extraction - 40 days from extraction to completion of analysis	Iced, 4 ± 2° C
TAL Metals Magnesium Sodium	EPA-WW 200.7 EPA-WW 200.7	Water	- 180 days from sample collection to completion of analysis	pH < 2 and Iced, 4 ± 2° C
LL-Mercury	EPA 1631	Water	- 28 days from sample collection to completion of analysis	pH < 2 and Iced, 4 ± 2° C
General Chemistry				
Cyanide (Amenable)	SM4500-CN-E	Water	- 14 days from sample collection to analysis	pH > 12 and Iced, 4 ± 2° C
Cyanide (Total)	SW-846 9012	Water	- 14 days from sample collection to analysis	pH > 12 and Iced, 4 ± 2° C

Notes

¹ Method References:

EPA 1631, Revision E "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry" USEPA Office of Water (EPA-821-R-02-019) August 2002.

SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and Promulgated updates, November 1986

TAL - Target Analyte List

TCL - Target Compound List

LL- - Low Level

VOC - Volatile Organic Compounds

PCB - Polychlorinated biphenyls

SVOC - Semivolatile Organic Compounds

TABLE 3
ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Sample Location</i>	<i>MW-101D</i>	<i>MW-101S</i>	<i>MW-102D</i>	<i>MW-102S</i>
<i>Sample Identification</i>	<i>GW-56393-102312-JV-113</i>	<i>GW-56393-102312-JV-112</i>	<i>GW-56393-102312-JV-110</i>	<i>GW-56393-102312-JV-109</i>
<i>Sample Date</i>	<i>10/23/2012</i>	<i>10/23/2012</i>	<i>10/23/2012</i>	<i>10/23/2012</i>
<i>Sample Type</i>				
<i>Screen Depth</i>	<i>Screen_Depth: (70-75)</i>	<i>Screen_Depth: (32-29)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (3-10)</i>
<i>Sample Elevation (feet AMSL)</i>	<i>664.33-589.33</i>	<i>702.35-663.35</i>	<i>664.43-619.43</i>	<i>701.18-691.18</i>
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs)</i>				
Acetone	µg/L	20 U	20 U	20 U
Benzene	µg/L	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	R	R	R
Carbon disulfide	µg/L	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	0.50 UJ	0.50 UJ	0.50 UJ
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	0.50 UJ	0.50 UJ	0.50 UJ
1,1-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U

TABLE 3
ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Sample Location</i>	<i>MW-101D</i>	<i>MW-101S</i>	<i>MW-102D</i>	<i>MW-102S</i>
<i>Sample Identification</i>	<i>GW-56393-102312-JV-113</i>	<i>GW-56393-102312-JV-112</i>	<i>GW-56393-102312-JV-110</i>	<i>GW-56393-102312-JV-109</i>
<i>Sample Date</i>	<i>10/23/2012</i>	<i>10/23/2012</i>	<i>10/23/2012</i>	<i>10/23/2012</i>
<i>Sample Type</i>				
<i>Screen Depth</i>	<i>Screen_Depth: (70-75)</i>	<i>Screen_Depth: (32-29)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (3-10)</i>
<i>Sample Elevation (feet AMSL)</i>	<i>664.33-589.33</i>	<i>702.35-663.35</i>	<i>664.43-619.43</i>	<i>701.18-691.18</i>
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs), continued</i>				
trans-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	20 U	20 U	20 U
Isopropyl benzene	µg/L	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	20 U	20 U	20 U
Methylene chloride	µg/L	2.0 U	2.0 U	2.0 U
Styrene	µg/L	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	0.50 U	0.50 U	0.50 U
Toluene	µg/L	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	0.50 U	0.50 U	0.50 U
m&p-Xylenes	µg/L	0.50 U	0.50 U	0.50 U
<i>Metals</i>				
Cyanide (amenable)	µg/L	10 U	10 U	10 U
Cyanide (total)	µg/L	10 U	10 U	10 U
Magnesium	µg/L	23300	24100	23200
Mercury	µg/L	0.001 U	0.001 U	0.001 U
Sodium	µg/L	23800	23700	20400

TABLE 3
ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

	<i>MW-101D</i>	<i>MW-101S</i>	<i>MW-102D</i>	<i>MW-102S</i>
<i>Sample Location</i>	<i>GW-56393-102312-JV-113</i>	<i>GW-56393-102312-JV-112</i>	<i>GW-56393-102312-JV-110</i>	<i>GW-56393-102312-JV-109</i>
<i>Sample Identification</i>				
<i>Sample Date</i>	<i>10/23/2012</i>	<i>10/23/2012</i>	<i>10/23/2012</i>	<i>10/23/2012</i>
<i>Sample Type</i>				
<i>Screen Depth</i>	<i>Screen_Depth: (70-75)</i>	<i>Screen_Depth: (32-29)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (3-10)</i>
<i>Sample Elevation (feet AMSL)</i>	<i>664.33-589.33</i>	<i>702.35-663.35</i>	<i>664.43-619.43</i>	<i>701.18-691.18</i>
Parameters	Units			
PCBs				
Aroclor-1016 (PCB-1016)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	ND	ND	ND

TABLE 3

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012**

<i>Sample Location</i>	MW-103D	MW-104D	MW-104S	MW-105D
<i>Sample Identification</i>	GW-56393-102312-JV-108	GW-56393-102212-JV-107	GW-56393-102212-JV-106	GW-56393-102212-JV-105
<i>Sample Date</i>	10/23/2012	10/22/2012	10/22/2012	10/22/2012
<i>Sample Type</i>				
<i>Screen Depth</i>	<i>Screen_Depth: (30-35)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (20-25)</i>	<i>Screen_Depth: (42-47)</i>
<i>Sample Elevation (feet AMSL)</i>	674.37-639.37	633.48-618.48	684.86-658.86	662.79-615.79
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs)</i>				
Acetone	µg/L	20 U	20 U	20 U
Benzene	µg/L	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	R	R	R
Carbon disulfide	µg/L	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	0.50 UJ	0.50 UJ	0.50 UJ
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	0.50 UJ	0.50 UJ	0.50 UJ
1,1-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U

TABLE 3
ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Sample Location</i>	<i>MW-103D</i>	<i>MW-104D</i>	<i>MW-104S</i>	<i>MW-105D</i>
<i>Sample Identification</i>	<i>GW-56393-102312-JV-108</i>	<i>GW-56393-102212-JV-107</i>	<i>GW-56393-102212-JV-106</i>	<i>GW-56393-102212-JV-105</i>
<i>Sample Date</i>	<i>10/23/2012</i>	<i>10/22/2012</i>	<i>10/22/2012</i>	<i>10/22/2012</i>
<i>Sample Type</i>				
<i>Screen Depth</i>	<i>Screen_Depth: (30-35)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (20-25)</i>	<i>Screen_Depth: (42-47)</i>
<i>Sample Elevation (feet AMSL)</i>	<i>674.37-639.37</i>	<i>633.48-618.48</i>	<i>684.86-658.86</i>	<i>662.79-615.79</i>
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs), continued</i>				
trans-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	20 U	20 U	20 U
Isopropyl benzene	µg/L	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	20 U	20 U	20 U
Methylene chloride	µg/L	2.0 U	2.0 U	2.0 U
Styrene	µg/L	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	0.50 U	0.50 U	0.50 U
Toluene	µg/L	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	0.50 U	0.50 U	0.50 U
m&p-Xylenes	µg/L	0.50 U	0.50 U	0.50 U
<i>Metals</i>				
Cyanide (amenable)	µg/L	10 U	10 U	10 U
Cyanide (total)	µg/L	10 U	10 U	10 U
Magnesium	µg/L	22100	23200	23100
Mercury	µg/L	0.001 U	0.001 U	0.001 U
Sodium	µg/L	18800	21600	20900

TABLE 3

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012**

	<i>Sample Location</i>	<i>Sample Identification</i>	<i>Sample Date</i>	<i>Sample Type</i>	<i>Screen Depth</i>	<i>Sample Elevation (feet AMSL)</i>
	MW-103D	MW-104D	MW-104S	MW-105D		
	GW-56393-102312-JV-108	GW-56393-102212-JV-107	GW-56393-102212-JV-106	GW-56393-102212-JV-105		
	10/23/2012	10/22/2012	10/22/2012	10/22/2012		
	Screen_Depth: (30-35)	Screen_Depth: (40-45)	Screen_Depth: (20-25)	Screen_Depth: (42-47)		
	674.37-639.37	633.48-618.48	684.86-658.86	662.79-615.79		
<i>Parameters</i>	<i>Units</i>					
PCBs						
Aroclor-1016 (PCB-1016)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	ND	ND	ND	ND	ND

TABLE 3
ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Sample Location</i>	MW-105S	MW-106D	MW-106D	MW-106S
<i>Sample Identification</i>	GW-56393-102212-JV-104	GW-56393-102212-JV-102	GW-56393-102212-JV-103	GW-56393-102212-JV-101
<i>Sample Date</i>	10/22/2012	10/22/2012	10/22/2012	10/22/2012
<i>Sample Type</i>			Duplicate	
<i>Screen Depth</i>	Screen_Depth: (5-12)	Screen_Depth: (40-45)	Screen_Depth: (40-45)	Screen_Depth: (2-9)
<i>Sample Elevation (feet AMSL)</i>	699.89-687.89	664.66-620.66	664.66-620.66	701.89-692.89
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs)</i>				
Acetone	µg/L	20 U	20 U	20 U
Benzene	µg/L	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	R	R	R
Carbon disulfide	µg/L	0.50 U	0.50 U	0.11 J
Carbon tetrachloride	µg/L	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	0.50 UJ	0.50 UJ	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	0.50 UJ	0.50 UJ	0.50 U
1,1-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U

TABLE 3

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Sample Location</i>	<i>MW-105S</i>	<i>MW-106D</i>	<i>MW-106D</i>	<i>MW-106S</i>
<i>Sample Identification</i>	<i>GW-56393-102212-JV-104</i>	<i>GW-56393-102212-JV-102</i>	<i>GW-56393-102212-JV-103</i>	<i>GW-56393-102212-JV-101</i>
<i>Sample Date</i>	<i>10/22/2012</i>	<i>10/22/2012</i>	<i>10/22/2012</i>	<i>10/22/2012</i>
<i>Sample Type</i>			<i>Duplicate</i>	
<i>Screen Depth</i>	<i>Screen_Depth: (5-12)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (2-9)</i>
<i>Sample Elevation (feet AMSL)</i>	<i>699.89-687.89</i>	<i>664.66-620.66</i>	<i>664.66-620.66</i>	<i>701.89-692.89</i>
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs), continued</i>				
trans-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	20 U	20 U	20 U
Isopropyl benzene	µg/L	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	20 U	20 U	20 U
Methylene chloride	µg/L	2.0 U	2.0 U	2.0 U
Styrene	µg/L	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	0.50 U	0.50 U	0.50 U
Toluene	µg/L	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	0.13 J	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	0.50 U	0.50 U	0.50 U
m&p-Xylenes	µg/L	0.50 U	0.50 U	0.50 U
<i>Metals</i>				
Cyanide (amenable)	µg/L	10 U	10 U	10 U
Cyanide (total)	µg/L	10 U	10 U	10 U
Magnesium	µg/L	27700	23500	23200
Mercury	µg/L	0.001 U	0.001 U	0.001 U
Sodium	µg/L	23800	22400	22200

TABLE 3
ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

	<i>Sample Location</i>	<i>MW-105S</i>	<i>MW-106D</i>	<i>MW-106D</i>	<i>MW-106S</i>
	<i>Sample Identification</i>	GW-56393-102212-JV-104	GW-56393-102212-JV-102	GW-56393-102212-JV-103	GW-56393-102212-JV-101
	<i>Sample Date</i>	10/22/2012	10/22/2012	10/22/2012	10/22/2012
	<i>Sample Type</i>			Duplicate	
	<i>Screen Depth</i>	Screen_Depth: (5-12)	Screen_Depth: (40-45)	Screen_Depth: (40-45)	Screen_Depth: (2-9)
	<i>Sample Elevation (feet AMSL)</i>	699.89-687.89	664.66-620.66	664.66-620.66	701.89-692.89
<i>Parameters</i>	<i>Units</i>				
<i>PCBs</i>					
Aroclor-1016 (PCB-1016)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	0.039 U	0.040 U	0.039 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	0.020 U	0.020 U	0.020 U	0.026 U
Aroclor-1242 (PCB-1242)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	0.020 U	0.0074 J	0.0057 J	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	ND	0.0074 J	0.0057 J	ND

TABLE 3

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012**

<i>Sample Location</i>	<i>MW-107S</i>	<i>MW-108D</i>	<i>MW-108S</i>	<i>MW-109D</i>
<i>Sample Identification</i>	GW-56393-102212-JV-100	GW-56393-102212-JV-099	GW-56393-102212-JV-098	GW-56393-102312-JV-111
<i>Sample Date</i>	10/22/2012	10/22/2012	10/22/2012	10/23/2012
<i>Sample Type</i>				
<i>Screen Depth</i>	<i>Screen_Depth: (8-13)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (2-9)</i>	<i>Screen_Depth: (22-27)</i>
<i>Sample Elevation (feet AMSL)</i>	695.76-682.76	663.39-618.39	701.32-692.32	689.41-666.41
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs)</i>				
Acetone	µg/L	20 U	20 U	20 U
Benzene	µg/L	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	R	R	R
Carbon disulfide	µg/L	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	µg/L	0.50 U	0.14 J	0.50 U
1,2-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U

**TABLE 3
ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012**

<i>Sample Location</i>	<i>MW-107S</i>	<i>MW-108D</i>	<i>MW-108S</i>	<i>MW-109D</i>
<i>Sample Identification</i>	GW-56393-102212-JV-100	GW-56393-102212-JV-099	GW-56393-102212-JV-098	GW-56393-102312-JV-111
<i>Sample Date</i>	10/22/2012	10/22/2012	10/22/2012	10/23/2012
<i>Sample Type</i>				
<i>Screen Depth</i>	<i>Screen_Depth: (8-13)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (2-9)</i>	<i>Screen_Depth: (22-27)</i>
<i>Sample Elevation (feet AMSL)</i>	695.76-682.76	663.39-618.39	701.32-692.32	689.41-666.41
<i>Parameters</i>	<i>Units</i>			
<i>Volatile Organic Compounds (VOCs), continued</i>				
trans-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	20 U	20 U	20 U
Isopropyl benzene	µg/L	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	20 U	20 U	20 U
Methylene chloride	µg/L	2.0 U	2.0 U	2.0 U
Styrene	µg/L	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	0.50 U	0.50 U	0.50 U
Toluene	µg/L	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	0.50 U	0.50 U	0.50 U
m&p-Xylenes	µg/L	0.50 U	0.50 U	0.50 U
<i>Metals</i>				
Cyanide (amenable)	µg/L	10 U	10 U	10 U
Cyanide (total)	µg/L	10 U	10 U	10 U
Magnesium	µg/L	28500	25000	25000
Mercury	µg/L	0.001 U	0.001 U	0.001 U
Sodium	µg/L	23000	35300	21700

TABLE 3

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

	<i>Sample Location</i>	<i>MW-107S</i>	<i>MW-108D</i>	<i>MW-108S</i>	<i>MW-109D</i>
	<i>Sample Identification</i>	GW-56393-102212-JV-100	GW-56393-102212-JV-099	GW-56393-102212-JV-098	GW-56393-102312-JV-111
	<i>Sample Date</i>	10/22/2012	10/22/2012	10/22/2012	10/23/2012
	<i>Sample Type</i>				
	<i>Screen Depth</i>	<i>Screen_Depth: (8-13)</i>	<i>Screen_Depth: (40-45)</i>	<i>Screen_Depth: (2-9)</i>	<i>Screen_Depth: (22-27)</i>
	<i>Sample Elevation (feet AMSL)</i>	695.76-682.76	663.39-618.39	701.32-692.32	689.41-666.41
<i>Parameters</i>	<i>Units</i>				
<i>PCBs</i>					
Aroclor-1016 (PCB-1016)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	0.040 U	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	ND	ND	ND	ND

Notes:

- U - Not present at or above the associated value.
- J - Estimated concentration.
- UJ - Estimated reporting limit.
- R - Rejected.

TABLE 4

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO VIOLATION OF INITIAL CALIBRATION ACCEPTANCE CRITERIA
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Parameter</i>	<i>Compound</i>	<i>Calibration Date</i>	<i>RRF</i>	<i>Associated Sample ID</i>	<i>Qualified Sample Results</i>	<i>Units</i>
VOCs	2-Butanone (MEK)	9/26/12	0.018	GW-56393-102212-JV-098	R	µg/l
				GW-56393-102212-JV-099	R	µg/l
				GW-56393-102212-JV-100	R	µg/l
				GW-56393-102212-JV-101	R	µg/l
				GW-56393-102212-JV-102	R	µg/l
				GW-56393-102212-JV-103	R	µg/l
				GW-56393-102212-JV-104	R	µg/l
				GW-56393-102212-JV-105	R	µg/l
				GW-56393-102212-JV-106	R	µg/l
				GW-56393-102212-JV-107	R	µg/l
				GW-56393-102312-JV-108	R	µg/l
				GW-56393-102312-JV-109	R	µg/l
				GW-56393-102312-JV-110	R	µg/l
				GW-56393-102312-JV-111	R	µg/l
GW-56393-102312-JV-112	R	µg/l				
GW-56393-102312-JV-113	R	µg/l				

Notes:

R - Rejected
RRF - Relative Response Factor
VOC - Volatile Organic Compounds

TABLE 5
QUALIFIED SAMPLE RESULTS DUE TO VIOLATION OF CONTINUING CALIBRATION REQUIREMENTS
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Parameter</i>	<i>Calibration Date</i>	<i>Compound</i>	<i>%D</i>	<i>Associated Sample ID</i>	<i>Qualified Sample Results</i>	<i>Units</i>
VOCs	11/1/12	Chloromethane (Methyl chloride)	32	GW-56393-102212-JV-102	0.50 UJ	µg/L
				GW-56393-102212-JV-103	0.50 UJ	µg/L
				GW-56393-102212-JV-104	0.50 UJ	µg/L
				GW-56393-102212-JV-105	0.50 UJ	µg/L
				GW-56393-102212-JV-106	0.50 UJ	µg/L
				GW-56393-102212-JV-107	0.50 UJ	µg/L
				GW-56393-102312-JV-108	0.50 UJ	µg/L
				GW-56393-102312-JV-109	0.50 UJ	µg/L
				GW-56393-102312-JV-110	0.50 UJ	µg/L
				GW-56393-102312-JV-111	0.50 UJ	µg/L
				GW-56393-102312-JV-112	0.50 UJ	µg/L
				GW-56393-102312-JV-113	0.50 UJ	µg/L
				VOCs	11/1/12	Dichlorodifluoromethane (CFC-12)
GW-56393-102212-JV-103	0.50 UJ	µg/L				
GW-56393-102212-JV-104	0.50 UJ	µg/L				
GW-56393-102212-JV-105	0.50 UJ	µg/L				
GW-56393-102212-JV-106	0.50 UJ	µg/L				
GW-56393-102212-JV-107	0.50 UJ	µg/L				
GW-56393-102312-JV-108	0.50 UJ	µg/L				
GW-56393-102312-JV-109	0.50 UJ	µg/L				
GW-56393-102312-JV-110	0.50 UJ	µg/L				
GW-56393-102312-JV-111	0.50 UJ	µg/L				
GW-56393-102312-JV-112	0.50 UJ	µg/L				
GW-56393-102312-JV-113	0.50 UJ	µg/L				

Notes:

UJ - Non-detect with an estimated report limit.

U - Non-detect

%D - Percent Difference

TABLE 6
SUMMARY OF QUALIFIED SAMPLE DATA DUE TO METHOD BLANK CONTAMINATION
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Parameter</i>	<i>Blank Date</i>	<i>Analyte</i>	<i>Blank Result</i>	<i>Associated Sample ID</i>	<i>Original Sample Result</i>	<i>Qualified Sample Result</i>	<i>Units</i>
VOCs	11/1/12	Chloromethane (Methyl chloride)	0.13 J	GW-56393-102212-JV-102	0.090 J	0.50 U	µg/L
				GW-56393-102212-JV-104	0.080 J	0.50 U	µg/L
				GW-56393-102212-JV-105	0.090 J	0.50 U	µg/L
				GW-56393-102312-JV-108	0.13 J	0.50 U	µg/L
				GW-56393-102312-JV-111	0.18 J	0.50 U	µg/L
				GW-56393-102312-JV-112	0.070 J	0.50 U	µg/L
				GW-56393-102312-JV-113	0.070 J	0.50 U	µg/L
Metals	10/24/12	Mercury	0.30 J	GW-56393-102212-JV-098	0.61 J	1.0 U	ng/L
				GW-56393-102212-JV-099	0.43 J	1.0 U	ng/L
				GW-56393-102212-JV-100	0.54 J	1.0 U	ng/L
				GW-56393-102212-JV-102	0.43 J	1.0 U	ng/L
				GW-56393-102212-JV-103	0.31 J	1.0 U	ng/L
				GW-56393-102212-JV-104	0.34 J	1.0 U	ng/L
				GW-56393-102212-JV-105	0.34 J	1.0 U	ng/L
				GW-56393-102212-JV-106	0.37 J	1.0 U	ng/L
				GW-56393-102212-JV-107	0.21 J	1.0 U	ng/L
				GW-56393-102312-JV-108	0.38 J	1.0 U	ng/L
				GW-56393-102312-JV-109	0.54 J	1.0 U	ng/L
				GW-56393-102312-JV-110	0.23 J	1.0 U	ng/L
				GW-56393-102312-JV-111	0.41 J	1.0 U	ng/L
				GW-56393-102312-JV-112	0.66 J	1.0 U	ng/L
GW-56393-102312-JV-113	0.52 J	1.0 U	ng/L				

Notes:

VOC Volatile organic compound
J Estimated
U Non-detect at associated value

TABLE 7
SUMMARY OF QUALIFIED SAMPLE DATA DUE TO RINSE BLANK CONTAMINATION
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2012

<i>Parameter</i>	<i>Rinse Blank Date</i>	<i>Analyte</i>	<i>Blank Result</i>	<i>Sample ID</i>	<i>Original Sample Result</i>	<i>Qualified Sample Result</i>	<i>Units</i>
VOCs	10/23/12	Chloroform (Trichloromethane)	0.74 J	GW-56393-102312-JV-108	0.090 J	0.50 U	µg/L
				GW-56393-102312-JV-110	0.14 J	0.50 U	µg/L
VOCs	10/23/12	Toluene	0.12 J	GW-56393-102212-JV-098	0.19 J	0.50 U	µg/L
				GW-56393-102212-JV-099	0.43 J	0.50 U	µg/L
				GW-56393-102212-JV-100	0.15 J	0.50 U	µg/L
				GW-56393-102212-JV-101	0.080 J	0.50 U	µg/L
				GW-56393-102212-JV-102	0.31 J	0.50 U	µg/L
				GW-56393-102212-JV-103	0.20 J	0.50 U	µg/L
				GW-56393-102212-JV-104	0.240 J	0.50 U	µg/L
				GW-56393-102212-JV-105	0.060 J	0.50 U	µg/L
				GW-56393-102212-JV-106	0.29 J	0.50 U	µg/L
				GW-56393-102212-JV-107	0.11 J	0.50 U	µg/L
				GW-56393-102312-JV-108	0.20 J	0.50 U	µg/L
				GW-56393-102312-JV-109	0.17 J	0.50 U	µg/L
				GW-56393-102312-JV-110	0.16 J	0.50 U	µg/L
				GW-56393-102312-JV-112	0.22 J	0.50 U	µg/L
				GW-56393-102312-JV-113	0.26 J	0.50 U	µg/L

Notes:

- VOC Volatile organic compound
J Estimated
U Non-detect at associated value